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25X1

11 March 1974

MEMORANDUM FOR: Mr. Rauer H. Meyer
Director
Office of Export Control
Bureau of East-West Trade
Department of Commerce

SUBJECT : Production of High Capacity Cable and Micro-
wave Systems in the USSR and Eastern Europe

Attached is a short discussion of the status of development and production of microwave radio-relay and cable communications systems in the USSR and Eastern Europe. It has been prepared to supplement the discussion in the draft report of the Telecommunications Equipment Technical Advisory Committee -- Foreign Availability of Analog Communications Transmission Equipment. A Table summarizing available data also is attached. It is hoped that our findings, which are somewhat at variance with those in the Committee report, will be helpful to the Committee in the preparation of its final report.

25X1

Please do not hesitate to call if we can be of any further assistance.

Machinery and Communications Branch
USSR/Eastern Europe Division
Office of Economic Research

Attachment
As stated

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25X1

25X1

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1. The USSR, East Germany, and Hungary are the only countries with major programs for the development and production of high capacity multiplex equipment. East Germany and Hungary carry out this activity, sometimes reluctantly, under a CEMA charge to produce for the USSR and other East European markets. However, research and development is carried out jointly with the USSR and most of their output of civil communications systems that is not used domestically is exported to the USSR.

2. East Germany, Hungary, and the USSR are not major suppliers of high-capacity communications systems to the other East European countries -- namely, Poland, Czechoslovakia, Bulgaria, and Rumania -- for two reasons: output is limited and the USSR is the priority consumer; and these countries prefer Western equipment because of its superior quality, reliability, and capability. For example, Bulgaria has modernized much of its civil network by direct imports from Western Europe.

3. During the past 15 years or so, the USSR, East Germany, and Hungary, have developed, produced, and deployed radio-relay and cable systems with designed capacities of 600, 960, and 1920 channels per trunk. However, these systems, in actuality, operate at only a fraction of designed capacity because none of these countries has been able to produce the carrier (multiplex) equipment needed for optimum system utilization. During most of the 1960's, these systems were multiplexed with 60-channel equipment. In recent years, 120-channel multiplexers have come into limited use, but the deployment of 600-channel and higher multiplex equipment is practically non-existent. These facts are astonishing. In the United States, the first commercial coaxial cable system -- the Bell System's L-1 which was installed in 1941 -- carried 480 voice channels over 2 tubes, or 240 channels per tube. Cut off from access to Western technology by virtue of the international embargo, Communist producers historically have been unable to develop the component technology (especially high quality filters) needed to combine 60-channel super-groups into higher aggregations.

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4. Since 1968, Communist capabilities to produce high-capacity carrier systems have improved owing to carrier manufacturing technology received by Hungary from L.M. Ericsson of Sweden. Although the full scope of that assistance has never been determined, it may be assumed that Hungary either can, or soon will be able, to produce carrier systems of up to 600 channels, and possibly 960 channels. It is not evident that such systems are yet in production. We have information that Hungary recently contracted to supply the USSR with 300-channel radio-relay systems that were apparently developed on the basis of Sweden's technology. In this case, also, it is not certain that 300-channel multiplexers are included, since, reportedly, the systems are to be used in the USSR to carry TV broadcasts.

5. High-capacity 1920-channel cable systems have been produced in the USSR for several years but without the associated multiplexing equipment; they have been used mainly for TV transmissions. Cable systems for 1920 channels also are under development in East Germany and Hungary. There is no evidence that these systems are in serial production. One such system, the VLT-1920, is under development in East Germany. The fact that a prototype of this system was exhibited at the 1973 Hanover Fair, and its operation described in an official brochure, has been taken as evidence of the capability of East Germany to produce these systems. It should be pointed out, however, that the demonstration of a prototype and the publication of a brochure certify only the existence of a prototype and of a brochure, and no meaningful inference concerning production can be drawn. For example, East Germany announced development of its RVG-962 microwave system (also called the R-300 in the USSR) and published a technical brochure on its operation, nearly 3 years ago. Yet the system still has not gone into serial production. Hungary's GTT 6000/1920 microwave system is another example. Development of this system began in the early 1960's and prototype tests were scheduled for 1966. Testing did not actually begin until 1969 and a report in May 1973 indicated that the system was still under development and had not entered production. Despite this, in 1971 the Hungarians published a brochure stating that the GTT 6000/1920 was in production.

-2-

CONFIDENTIAL

CONFIDENTIAL

6. It must be concluded, on the basis of all the information available, that high-capacity multiplexing systems (600, 960, and 1920-channels) of domestic-manufacture are virtually non-existent in Communist countries. And Soviet access to higher capacity systems from non-Communist, non-COCOM sources would appear to be severely limited. For example, it has been alleged that multiplexing equipment for 2700 channels and 10,800 channels is available from L.M. Ericsson of Sweden, and from Spain. However, L.M. Ericsson's 2700-channel system uses US components that are on the Commodity Control List (unilaterally controlled by the US); and the 10,800-channel system uses repeater equipment manufactured in West Germany. Hence, the export of these systems effectively is controlled by the US and COCOM respectively. Apparently, L.M. Ericsson does not consider the Communist market important enough to justify producing the embargoed components on its own in order to circumvent US and COCOM controls.* Similarly, the two potential suppliers of 2700 channel multiplex equipment in Spain -- Standard Electrica, S.A., and Telettra Espanola, S.A., are subsidiaries or affiliates of companies located in COCOM member countries. Thus, their exports to Communist countries are subject to control.

7. Finally, the strategic importance of high-capacity common-carrier (multi-purpose, multi-user) communications systems should be clarified. The TAC report implies that if US-made systems are applied to a civilian end-use, there would be no strategic risk. However, the fact is that in the USSR and Eastern Europe, the military forces extensively use the cable and microwave systems of the civil ministries of communications for mainline, strategic circuits,** in addition to separate military systems for command and control. Moreover, many circuits are dedicated for exclusively military use. Hence, the reliability and capabilities of military communications in Communist countries would be enhanced by the installation of modern Western equipment on common carrier circuits.

25X1

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** This is common practice in the West also. For example, the military establishment relies on the Bell System for the required domestic switching, transmission trunks, and access lines. (Military Communications - 1968. Hearings before House Subcommittee on Government Operations, 90th Congress, 17-18 June 1968, pp. 10-17.)

-3-

CONFIDENTIAL

Microwave and Cable Systems Developed and Deployed in Eastern Europe and the USSR

Country	System a/	Voice-Channel Capacity		Frequency	Production	Comments
		Design	Actual b/			
<u>East Germany</u>	RVG-958	600	60-120	4 GHz	Discontinued	Developed and deployed in the 1950's.
	RVG-960	960	60-120	4 GHz	Yes. No data.	Deployment may be imminent.
	RVG-962	300	--	11 GHz	No.	Still under development.
	VLT-1920*	1920	--	8.6 MHz	No.	Apparently development has reached initial test stage. A test link reportedly has been set up.
<u>Hungary</u>	GTT 4000/600	600	60-120	4 GHz	Yes. In production since early 1960's.	Most sets produced have been exported to the USSR.
	GTT 6000/1920	1920	--	6 GHz	No.	Under development since early 1960's. Joint development with USSR. In USSR system is called "Druzhiba". A prototype was first tested in 1969, and a test link for TV is currently under construction in the USSR.
	GTT 8000/300	300	Possibly 300 c/	8 GHz	Possibly. May be approaching stage of limited production.	Under development mainly for export to the USSR (under nomenclature R-300).

a/ Cable systems are denoted by an asterik.

b/ That is, reported, or otherwise known.

c/ It is believed that the multiplexing equipment for this system will be produced in Hungary under license from L.M. Ericsson of Sweden. In 1968, Ericsson ended its support of the international (COCOM) embargo on the export of strategic goods to Communist countries, and contracted to provide Hungary with technology to produce modern high-capacity multiplex systems. This deal may permit Hungary eventually to produce up to 960-channel multiplex equipments.

Country	System a/	Voice-Channel Design	Capacity Actual b/	Frequency	Production	Comments
USSR	R-60/120	60-120	60-120	1.6-2.0 GHz	Yes. Early 1960's. Probably phasing out.	
	R-600 d/ and	600	60-120	3.4-3.9 GHz	Yes. Early 1960's. Probably phasing out.	
	R-600M e/	600	--	3.4-3.9 GHz	No.	R-600M and R-600 2M appear to have been built in prototype only. Very few systems have been noted.
	R-6002M e/	1020	--	3.4-3.9 GHz	No.	
	R-6002MV e/	1020	Unknown	3.4-3.9 GHz	Yes. 1969	
	Voskhod	1920	--	4 GHz	No.	
	K-1920*	1920	Unknown f/	273-8544 KHz	Yes. In production since the early 1960's.	Said to be of poor quality (1969) and in need of modernization.
	K-1920-U*	1920	Unknown	273-8544 KHz	Yes.	Development, based on long life (30,000 hrs.) tubes, completed in 1969. Change to transistors slow. For example, only the tertiary converter and oscillator of the terminal equipment had transistors as of 1970. Experimental models said to have passed line tests in 1972. Production claimed to have begun in 1973.

d/ Most are used mainly to pass television. Frequently equipped for only 60 voice channels. Often, there is no multiplexing capability.

e/ Modifications to the basic system.

f/ Used mostly to pass television. There is no evidence that the system ever has been multiplexed to capacity.

Country	System a/	Voice-Channel Capacity		Frequency	Production	Comments
		Design	Actual b/			
USSR (Cont.)	K-60 g/	60	60	60-252 KHz	Yes. 1960-61	
	K-120 g/	120	--	60-552 KHz 812-1304 KHz	No.	Development "completed" in 1969 but still under tests. Problems getting into serial production.
	K-300*	300	--	60-1300 KHz	No.	Development "completed" in 1969 but still under tests. Problems getting into serial production.

g/ Believed used for both cable and radio-relay.